UNITED STATES

AGENCY FOR INTERNATIONAL DEVELOPMENT/

BULGARIA

Final Report

Bulgaria Municipal Energy Efficiency Project

Project No. MAARD#D383005
Contract No. 183-C-00-03-00101-00

Prepared by:

MWH Americas, Inc.
175 West Jackson Blvd.
Chicago, IL 60604

and

Electrotek Concepts, Inc.
2111 Wilson Blvd., Suite 323
Arlington, VA 22201

May 31, 2004

Table of Contents

General Information

1. Project Identification Title: Bulgaria Municipal Energy Efficiency Project
2. Contractor: MWH Americas, Inc.
3. Subcontractor: Electrotek Concepts, Inc.
4. Contract # LAG-I-CO-98-00002 00
5. Start Date: March 16, 2003
6. Projected completion date: April 30, 2004
7. Project Manager: Michael Velikanov

MEEP Tasks

The Municipal Energy Efficiency Project (MEEP) focused on the following tasks:

- Task1: Cooperation with all stakeholders involved in the bankable project identification, development and financing;
- Task 2: Enhanced business relationships with United Bulgarian Bank (UBB) and First Investment Bank (FIB);
- Task 3: Expanded business relationships with multilaterals, commercial financial institutions and lenders, and private investors;
- Task 4: Identification, development and financial deal structuring with UBB and FIB under the DCA guarantees;
- Task 5: Project implementation and monitoring;
- Task 6: Continue and enhance development of project financing with FIB and other lenders and investors;
- Task 7: Enhancement of a focused public relations campaign for widespread awareness of tangible results and implementation of the established methodology;
- Task 8: Capacity building;
- Task 10. Exit strategy to transfer the technical skills and methodologies to the financial institutions, the municipal and private sector sponsors and developers in order to insure sustainability for energy efficiency projects.

Tasks Accomplishment

Task 1. Cooperation with all stakeholders involved in bankable project identification, development and financing

Subtasks

- Direct contacts with municipalities and industrial enterprises;
- Collaboration with USAID and other programs, e.g., EcoLinks, LGI, SME, USDOE, UN/ECE, etc.;
- Cooperation with Bulgarian energy efficiency centers, consulting and engineering companies;
- Collaboration with UBB and FIB headquarters, local branches and recommended clients;
- Cooperation with other lenders and investors if necessary.

Achieved Results

Direct contacts with municipalities and industrial enterprises. The Electrotek team visited over 59 cities and met with 22 municipalities, 4 of which for municipal and regional hospitals projects and 37 industrial enterprises to introduce benefits from energy efficiency project financing and opportunities for the participation in the MEEP and project financing using the Development Credit Authorities (DCA) loan guarantees. Practically every week the Electrotek team traveled outside of Sofia to market the facility to municipalities and industrial enterprises to work directly with project sponsors on specific projects. Entities visited by the Electrotek team are listed in Table 1.

Table 1. List of Visited and Contacted Companies and Municipalities

	Contact	Location City
1	Ahinora JSC	Isperih
2	Municipality	Stambolovo
3	Municipality	Antonovo
4	Municipality	Polski Trambesh
5	Simat JSC	Dimitrovgrad
6	Hospital	Omurtag
7	Hospital	Svishtov
8	Municipality	Vidin
9	HPP Turmush	Tumrush
10	HPP Luki	Luki
11	Kronos Ltd.	Sliven
12	Alen Mak JSC	Plovdiv
13	IBC & GRACIANI Ltd.	Pernik
14	Kimtek JSC	Plovdiv
15	Glavbulgarstroi	Sofia
16	Feshko Ltd.	Byala
17	Cooperation of Regina	Sliven
18	Storko JSC	Pleven
19	Bulkons Ltd.	Parvomay
20	Alkom JSC	Sofia
21	HPP Kostena	Goce Delchev
22	HPP Kamenica	Goce Delchev
23	Municipality	Popovo
24	Municipality	Jakoruda
25	Zebra JSC	Novi Iskar
26	Forum AD - HPP Sokolna	Stara Zagora
27	Balkanpharma - Razgrad JSC	Razgrad
28	KCM	Plovdiv
29	Municipality	Hissar
30	Municipality	Rakovski
31	HPP Dolene	Plovdiv
32	Municipality	Kaloyanovo
33	River Energy JSC	Roman
34	Municipality	Chelopech
35	Knauf JSC	Vidin
36	Lomsko Pivo JSC	Lom
37	Regional Hospital	Vidin
38	Regional Hospital	Targovishte
39	Start Ltd.	Dobrich
40	Municipality	Opaka
41	Dobrudja Kit JSC	Isperih
42	HKK Isperih JSC	Isperih
43	Wind power plant- Kavarna	ET City - Rousse
44	Wind power plant- Kavarna	Hiltan Agric. - Rousse
45	Wind power plant- Kavarna	Rousse
46	Vintreid	Razgrad
47	Ecoenergy - association of independent energy producers	
48	Ecoelectric AD - HPP Micrevo	Blagoevgrad
49	River energy - HPP project	Roman
50	RES projects -wind power project	Sofia
51	Municipality	Orjahovo
52	Alcomet Jsc	Shumen
53	Aniac AD (Wind power project	Sevlievo
54	Municipality	Karlovo
55	Municipality	Targovishte
56	Municipality	Kardjali
57	Municipality	Karnobat
58	Municipality	Goce Delchev
59	Municipality	Kjustendil

Collaboration with USAID and other programs, e.g., EcoLinks, LGI, SME, USDOE, UN/ECE.

Electrotek team collaborated with the USAID Mission in Sofia regarding program results and achievements awareness and information dissemination. Presentations have been delivered on a continuous basis at USAID events in Sofia. A site visit to the MEEP project # 1 – the Pirinsko Pivo Brewery was organized for representatives of the U.S. House of Representatives – Foreign Operations and Export Financing on August 15, 2003. Information and success stories brochures were provided to the Commercial Service of the U.S. Embassy, for the needs of EcoLinks follow-up activities, also on a request basis.

Cooperation with Bulgarian energy efficiency centers, consulting and engineering companies.

The Electrotek team continued the development of relationship with energy efficiency centers and had a number of meeting and discussions on potential energy efficiency projects with Regional Energy Center of Lovetch, Association for Energy Utilization of Biomass, ESD Bulgaria, Promishlena Energetika Yambol, Sofia Energy Center, Black Sea Regional Energy Center. In addition, Electrotek had working meetings with representatives of Ministry of Energy and Energy Resources and State Agency for Energy Efficiency. Full information on program achievements and approaches was delivered to high-level officials including the project development status, issues of risk analyses, financial modeling and sensitivity analyses, environmental assessments, etc. A set of all success stories and the web-based energy efficiency school information were also presented to the officials.

Collaboration with UBB and FIB headquarters, local branches and recommended clients.

The Electrotek team met with all 52 UBB branches in the 7 regions and regional managers, supporting operational relationships with customer relationship officers, branch directors and loan officers to introduce benefits from MEEP/DCA, discuss project financing opportunities and structure specific deals under the DCA loan guarantees. Electrotek has also developed on-the-job training of credit officers, as a part of the exit strategy.

Electrotek has established very operational and effective relationships with the UBB headquarters, the SME Center management and the Lending Programs Department.

After preliminary conversations and reviews of the companies and municipalities presented in Table 1, Electrotek introduced 20 projects and companies to UBB.

Cooperation with other lenders and investors.

Electrotek developed relationships with other lenders in order to support project sponsors in their financial funding requirements, in case they were not qualified for UBB's requirements. Two companies received offers from other lenders, and one achieved a financial deal with an equity investor for projects developed by Electrotek. After an initial refusal by UBB to finance the Tumrush Hydro Power Plant in Stara Zagora, the project sponsor sought offers from other banks, and with Electrotek's support the project was financed by this bank. The Lucky Hydro Power Plant was also developed by Electrotek and presented to UBB. After several meetings and discussions, the company decided to forgo UBB debt financing and search for equity financing.

Task 2. Enhanced business relationships with UBB and FIB

Achieved Results

The Electrotek team had regular meetings with all 52 UBB branches to support operational relationships with customer relationship officers, branch directors and loan officers and to introduce benefits from MEEP/DCA, discuss project financing opportunities and structure specific deals under the DCA loan guarantees. In over 15 branches, Electrotek developed on-the-job training of credit officers and provided the project due diligence knowledge transfer, as a part of the exit strategy.

In addition, Electrotek had regular meetings with regional managers of UBB, discussing the project identification opportunities in regions, and conducting training on energy efficiency project due diligence and risk analysis.

Electrotek met with FIB a number of times, and submitted a project for their review, but the bank expressed no real interest in providing debt financing for energy efficiency projects, even with their DCA guarantee facility.

Task 3. Expanded business relationships with multilaterals, commercial financial institutions and lenders, and private investors

Achieved Results

The Electrotek representatives had meetings with the World Bank and EBRD representatives to discuss opportunities for their involvement in projects requiring additional risk sharing due to limited project sponsor's abilities to meet UBB's requirements to secure debt financing under the DCA partial loan guarantees. These projects include wind farms and small hydropower projects sponsored by Bulgarian entities with very limited assets to secure debt financing from UBB.

The Electrotek team introduced energy efficiency and renewable project opportunities to several Bulgarian and international equity funds including Zlaten Lev Holding, Renewable Energy and Energy Efficiency Fund, Environmental Investment Partners, Soros Investment Capital Management, SigmaBleyzer Funds, Western NIS Enterprise Fund, SEAF and the Bulgarian Social investment fund of the World Bank. Electrotek discussed with representatives of these funds their direct equity co-financing of energy efficiency and renewable energy projects and also opportunities for financing of municipal projects through ESCOs. In particular, Electrotek had more than 5 meetings with Zlaten Lev Holding and SEAF for developing project financing through alternative financing schemes.

Task 4. Identification, development and financial deal structuring with UBB and FIB under the DCA Guarantees

Achieved Results

During the reporting period, the Electrotek Team identified and reviewed over 40 projects including 10 projects proposed directly by municipalities, industrial enterprises and project developers, and 5 projects suggested by UBB. Half of these projects were a direct result of collaboration and know-how transfer among municipalities with the involvement of neighbor local governments who already implemented MEEP/DCA projects.

Electrotek developed business plans for 10 of these reviewed projects and all of them were approved. These projects include the waste treatment project in Stara Zagora, two hospital projects, a biomass-heating project, a small hydropower project and several small municipal street lighting projects in municipalities of Dulovo, Tutrakan, Sitovo, Zlatograd and Antonovo. This diversity of projects is a significant MEEP achievement.

The municipality project in Venec, the small hydropower project ARA AD and the municipal hospital project in Omurtag did not use the DCA mechanism due to different technical and procedural reasons after the approval of UBB. In particular, the municipal hospital project in Omurtag, fully developed by Electrotek, was approved by UBB under the DCA guarantees, but the project sponsor refused to implement the project and decided to change the energy efficiency project later.

The entire portfolio of projects implemented under the MEEP/DCA program is also presented in Table 1.

Table 1. DCA Project Portfolio

	Project Sponsor	Location	Project Cost ($)	Loan Size under DCA ($)	% of DCA Portfolio (%)
1	Pirinsko Pivo Brewery	Blagoevgrad	$499,051	$368,098	3.68%
2	Municipality	Pernik	$551,590	$183,355	1.83%
3	Municipality	Pazardjik	$186,447	$129,985	1.30%
4	Municipality	Silistra	$392,431	$273,710	2.74%
5	Municipality	Popovo	$86,672	$55,215	0.55%
6	Municipality	Sevlievo	$284,126	$156,135	1.56%
7	Municipality	Veliko Tarnovo	$583,134	$410,996	4.11%
8	Municipality	Popovo	$109,729	$67,239	0.67%
9	Elprom Elin	Kubrat	$145,589	$100,613	1.01%
10	Municipality	Targovishte	$480,629	$334,444	3.34%
11	Energia Batteries	Targovishte	$1,367,474	$960,625	9.61%
12	Municipality	Dupnitza	$199,786	$139,850	1.40%
13	Galus Poultry	Rousse	$1,006,970	$680,368	6.80%
14	Municipality	Razgrad	$271,981	$202,026	2.02%
15	Municipality	Yambol	$125,799	$92,025	0.92%
16	Municipality	Pazardjik	$536,448	$400,555	4.01%
17	Agropolychim Fertilizers	Devnja	$2,296,289	$1,700,000	17.00%
18	Municipality	General Toshevo	$57,945	$43,338	0.43%
19	Autotransport	Targovishte	$166,380	$166,380	1.66%
20	Sugar Plant	Gorna Orjahovitza	$1,553,988	$1,226,994	12.27%
21	Municipality	Popovo	$167,283	$125,347	1.25%
22	Municipality	Yambol	$338,553	$253,915	2.54%
23	Municipality	Karlovo	$267,821	$201,133	2.01%
24	Municipality	Dulovo	$149,321	$112,020	1.12%
25	Nelsen chistota	Stara Zagora	$539,953	$490,275	4.90%
26	Municipality	Tutrakan	$72,078	$54,058	0.54%
27	Municipality	Sitovo	$98,117	$73,526	0.74%
28	Municipality	Zlatograd	$211,733	$155,138	1.55%
29	Municipality	Antonovo	$85,235	$60,818	0.61%
30	Municipal hospital	Svishtov	$191,350	$55,215	0.55%
	Total Projects Financed under DCA		**$13,023,902**	**$9,273,395**	**92.73%**

Note: The figures for the project cost and project loan amount in the table are calculated for an exchange rate of 1.63 Leva per $.

Table 2 presents capital budgeting indicators of all projects developed and financed under the MEEP, including the three project mentioned above that were financed without the DCA guarantees.

About 38% of the portfolio is formed by municipal projects. There are no defaults or bad loans in the loan portfolio. Pirinsko Pivo, Pernik

Municipality, Silistra Municipality and Pazardjik Municipality have paid their loans off, the Popovo Municipality has repaid two DCA loans.

It is important to note, that the municipality of Popovo implemented three projects, the fourth project is under the development and is waiting for an offer from UBB. The Municipality of Yambol the Municipality of Pazardjik implemented two projects. This is an important indicator of the energy efficiency financing mechanism sustainability.

Table 2. Financial Indicators of Projects Financed under MEEP

	Project Sponsor	Location	Project Cost $	UBB Loan $	Debt/Equity Ratio %	Loan Term Months	IRR %	Project Approved Month/Year	Loan Maturity Month/Year
1	Pirinsko Pivo	Blagoevgrad	$499,051	$368,098	72/28	48	38.6	Jun-00	May-04
2	Municipality	Pernik	$551,590	$183,355	33/67	34	50.2	Nov-00	Jun-03
3	Municipality	Pazardjik	$186,447	$129,985	70/30	29	57	Mar-01	May-02
4	Municipality	Silistra	$392,431	$273,710	71/29	30	88.3	Jun-01	Mar-03
5	Municipality	Popovo	$86,672	$55,215	64/36	28	36.1	Jun-01	Oct-03
6	Municipality	Sevlievo	$284,126	$156,135	62/38	60	30.8	Jul-01	Apr-05
7	Municipality	Veliko Tarnovo	$583,134	$410,996	71/29	52	28.1	Oct-01	Nov-05
8	Municipality	Popovo	$109,729	$67,239	61/39	29	42.1	Oct-01	Feb-04
9	Elprom Elin JSC	Kubrat	$145,589	$100,613	69/31	36	47.3	Oct-01	Sep-04
10	Municipality	Targovishte	$480,629	$334,444	70/30	48	29.5	Oct-01	Sep-05
11	Energia JSC	Targovishte	$1,367,474	$960,625	70/30	54	22.8	Apr-02	Aug-06
12	Municipality	Dupnitza	$199,786	$139,850	70/30	48	26	Jun-02	May-06
13	Galus Impex	Russe	$1,006,970	$680,368	74/26	60	18.3	Sep-02	Jun-07
14	Municipality	Razgrad	$271,981	$202,026	74/26	60	20.5	Aug-02	Jun-07
15	Municipality	Yambol	$125,799	$92,025	73/27	36	44.6	Aug-02	Jul-05
16	Municipality	Pazardzhik	$536,448	$400,555	75/25	39	27.9	Sep-02	Dec-05
17	Agropolychim	Devnja	$2,296,289	$1,700,000	75/25	39	34.6	Nov-02	Dec-05
18	Municipality	Gen.Toshevo	$57,945	$43,338	75/25	54	19.9	Oct-02	Mar-07
19	Autotransport	Targovishte	$166,380	$166,380	75/25	46	23	Oct-02	Aug-06
20	Sugar Plants	G.Orjahovitza	$1,553,988	$1,226,994	79/21	60	20.7	Nov-02	Dec-07
21	Municipality	Popovo	$167,283	$125,347	75/25	58	19.9	Jan-03	Sep-07
22	Municipality	Karlovo	$338,553	$253,915	75/25	48	31.6	Feb-03	Apr-07
23	Municipality	Yambol	$267,821	$201,133	75/25	67	13.7	Mar-03	Oct-08
24	Municipality	Dulovo	$149,321	$112,020	75/25	60	17.9	Mar-03	May-08
25	Solid Waste Utility	Nelsen	$539,953	$490,275	100% loan	63	24.5	Apr-03	Jul-08
26	Municipality	Tutrakan	$72,078	$54,058	75/25	63	16.7	Apr-03	Jul-08
27	Municipality	Venetz	$50,465	$30,675	61/39	48	28.3	May-03	Jun-07
28	Municipality	Sitovo	$98,117	$73,526	75/25	48	17.6	May-03	Nov-07
29	SHPP Arnaoutovtzi	Simitly	$297,443	$92,025	31/69	60	19.1	Jun-03	Apr-08
30	Municipality	Zlatograd	$211,733	$155,138	73/27	60	16.5	Jun-03	Jun-08
31	Municipality	Antonovo	$85,235	$60,818	71/29	40	39.1	Jul-03	Nov-06
32	Municipal Hospital	Omurtag	$60,613	$45,460	75/25	54	22.7	Jul-03	Jan-07
33	Municipal Hospital	Svishtov	$191,350	$55,215	28.9/71.1	37	33.7	Oct-03	Nov-06
	Total Porjects		**$13,432,423**	**$9,441,555**					

Task 5. Project implementation and monitoring

Subtasks

- At the request of municipalities and industrial enterprises – assistance with equipment specification, development of bid packages, review and selection of vendors and installation contractors;
- At the request of UBB and FIB – monitoring of the use of disbursed funds and the financial performance of borrowers.

Achieved Results

The Electrotek's team provided support to municipalities and industrial enterprises in tender preparation, equipment/vendor evaluation and selection. Electrotek has made recommendations on the equipment for the specific projects and helped project sponsors to review offers from equipment suppliers. Electrotek helped all municipalities developing street lighting projects with the procurement documentation and criteria settings development.

The Electrotek's team performed detailed analysis of the project implementation process upon UBB's request and provided recommendations on the project implementation improvement.

Electrotek provided monitoring of the DCA loan disbursement and amortization schedules and maintained the DCA loan database. All the projects in the MEEP portfolio were implemented as was required in business plans. Six loans are already fully repaid, and the remaining 25 outstanding loans will be paid-off on schedule. .

Task 6. Continue and enhance development of project financing with FIB and other lenders and investors

Subtasks

- At the request of industrial enterprises – technical assistance with structuring project financing with FIB and/or other lenders and investors;
- Requests of FIB – technical assistance in structuring long-term project financing and due diligence of submitted proposals;

Achieved Results

A number of Bulgarian banks indicated their intention to proceed with financing of feasible energy efficiency projects. Some banks demonstrated very aggressive marketing policy and offered very attractive loan terms and conditions to project sponsors of energy efficiency projects developed initially for the DCA facility. One project was financed by another bank, since UBB did not offer competitive loan terms and conditions.

The Electrotek Team monitored lending requirements of competing commercial banks including Raiffeisen, Biochim, Bulbank and Demirbank, and discussed with UBB opportunities for competitive financing under the DCA loan guarantees. Electrotek also collected information for the requirements of other lending and financing programs, like the Social Investment Fund of the World Bank, the EBRD BAS program, and other international and governmental financing programs. Electrotek also discussed various opportunities for energy efficiency project financing with a number of equity fund managers.

Task 7 Enhancement of a focused public relations campaign for widespread awareness of tangible results and implementation of the established method

Subtasks

- Public relations campaign - widespread awareness of tangible results
  - Benefits to the banking sector from the long-term financing of feasible projects;
  - Benefits to project sponsors (municipalities and industrial enterprises) from commercial financing of bankable projects;
- Implementation of established methodology for:
  - Project development
    - ✓ Project identification schemes and methods;
    - ✓ Best project candidate selection criteria and filtration method;
    - ✓ Project development models and methods including technical analysis, cash flow and risk analysis, financial schemes and bankable proposals (business plans);
  - Project financial deal structuring
    - ✓ Cooperation with lenders and investors - presentation of benefits from long-term project financing and introduction of risk mitigation strategy;
    - ✓ Cooperation with financial management of project sponsors (municipalities and private industrial enterprises)
    - ✓ Introduction of requirements to bankable project development and financing, and new financial schemes.

Achieved Results

Widespread awareness of tangible results

Electrotek's experts took part in more than 10 conferences organized at the national level and hosted by governmental departments, private companies and NGOs. Each one of these meetings was attended by more than 50 professionals. The Electrotek's team assisted with presentations delivery, hand-outs, CD-ROMs, printed materials and participation in public discussions and round tables. These events are briefly presented below:

Date	Venue
March 4, 2004	Czech ecology workshop on ecology and renewable energy resources usage, green certificates trading, equipment and legislation and financing of projects in cooperation with the Czech Embassy, Ministry of Environment and Waters, Energy Efficiency Agency and other organizations. *Nikolay Vangelov took part in the event and discussions.*
March 2003	Long-Term Strategy for Energy Efficiency in ZEBRA AD Promotion, Ecolinks Project *Nikolay Vangelov took part in round table discussions.*
March 31 – April 1, 2003	National Energy Efficiency Strategy and Action Plan – Phase II The conference was organized by the Energy Efficiency Agency in collaboration with Canadian International Development Agency and Black Sea Regional Center. The conference focused on Energy Service Companies – political framework and institutional aspects, financial issues and marketing of ESCOs, pitfalls and benefits. *Eli Koleva took part in discussions and presented the 3-year successful experience and achievements of MEEP and DCA.*
May 27, 2003	Natural Gas for Sustainable Development Workshop The workshop was organized by Overgas Ink., Ministry of Environment and Waters, Ministry of Energy and Energy Resources, Bulgarian Petrol and Gas Association, National Assembly of Municipalities in Bulgaria, World Movement Ecoforum for Peace, Bulgarian Trade Chamber, and Natural Gas Association. The workshop discussed possibilities of the natural gas for the ecological clean energy, distribution problems in Bulgaria, untraditional sources of natural gas in Bulgaria, increasing the consumption of the NG, pollutions reduction, the impact of the Energy Efficiency Law on the households gasification. Municipal energy efficiency projects for gasification were presented by the mayor of the Pazarjik municipality, the project sponsor for two energy efficiency projects under the MEEP/DCA project. *Nikolay Vangelv took part in the event.*
June 6, 2003	Bulgarian Investment Forum Investments in Ecology – the Winning Strategy *Dimtcho Linkov participated with a presentation of MEEP projects in the Session 3 – Ecoenergy – the Energy Efficiency and Renewable Energy Resources.*
June 18, 2003	Balkans Infrastructure Development Facility for Private Sector Participation in Infrastructure Projects The conference was organized by Bulgarian Foreign Investment Agency, USAID and IFC. *Dimtcho Linkov was invited as a guest speaker to present MEEP/DCA achievements.*
July 7, 2003	Developing the Municipal Credit Market in Bulgaria The conference was organized by the Institute for Public Administration and European Integration and Local Government Initiative – USAID The conference was focused on municipal borrowing market development in Bulgaria, legislative and regulatory framework; design of action plans for municipal borrowing and other issues of concern like difficulties for the municipal borrowing etc. Participants of the conference included Parliamentary Economic Commission, Institute for

	Pubic Administration and European Integration, Ministry of Regional Development, mayors of municipalities of Rouse, Plovdiv, and other cities and representatives of Bulgarian banks. *Renata Natan took part in discussions*
August 15, 2003	Site visit organized by Electrotek for a group of 10 officials from the U.S. House of Representatives – Foreign Operations and Export Financing at Pirinsko Pivo Brewery, together with Ms. Debra MacFarland, USAID Sofia Mission Director and Mr. Edward LaFarge, Private Enterprise Officer
August 1, 2003	First Biomass Manufacturers Workshop The workshop was organized by the Association of ecological utilization of the biomass as a problem solving session. *Electrotek took part in the event with a presentation of MEEP achievements and lessons learned*
September 2003	Investment Forum Silistra The Forum focused on investments in agriculture, waste recycling from the agricultural activity with the participation of Municipal Energy Efficiency Network. *Dimtcho Linkov took part in the round tables and discussions.*
November 12, 2003	Sustainable Local Government Energy Planning Conference was organized by ESD Bulgaria and UK Department for International Development with participation of the Bulgarian Ministry of Energy and Energy Resources, several banks and financial institutions, and municipalities of Kjustendil, Pazardjik, Lovetch, Silistra and other cities. *Renata Natan and Dimtcho Linkov participated in discussions and presented the information on the MEEP/DCA program during the Financing Opportunities Session.*
November 4, 2003	SEETEC/AEE National Energy Efficiency Strategy and Action Plan Development, Phase III *Dimtcho Linkov took part in the discussions and presented the MEEP activities*
December 2, 2003	Energy Efficiency in Industries: Current Development and Vision for the Future The seminar was organized by the Black Sea Regional Energy Center with presentations from governmental officials and international experts. The seminar was focused on institutional framework and state policy, energy efficient industrial technologies, project financing opportunities, emission trading. *Electrotek provided brochures on MEEP/DCA results and participated in discussions.*

In order to create a broad awareness of opportunities for energy efficiency projects and benefits from the project implementation, Electrotek has prepared an article in *Industrial products and applications magazine* – published in May 2004. The article presents the biomass combustion for a hospital heating project and explains in detail the development of this first project at the Municipal Hospital in Svishtov, which provides heating through biomass burning. The article is presented in the Appendix to the report.

Another article was published in the first issue of the new publication of the Capital weekly newspaper - *Utilities magazine*. The article discussed a municipal street-lighting project, municipal hospital project and an industrial project as examples of successful debt financing of energy efficiency projects. The article is presented in the Appendix to the report.

Electrotek developed the following publications about MEEP opportunities, results and lessons learned:

- Publication in the Capital weekly newspaper about the MEEP procedures and results (see Appendix);
- Article in Pari daily on April 15, 2003 about the Agropolichim Energy Efficiency Project – issue (see in Appendix);
- Article in Pari daily July 17, 2003 about the Zaharni Zavodi Energy Efficiency Project (see Appendix);
- Nine articles in local newspapers about implemented municipal projects;
- Presentation of implemented municipal projects by local cable TV broadcasts;
- Presentation of MEEP on the web page and in the report of the Czech Cultural Center;

The MEEP website (http://www.electrotek.com/meep/) continues to provide information on program development and updates.

Implementation of established methodology for project development and project financial deal structuring

The methodology used by Electrotek's engineers and financial analysts for energy efficiency project development was widely promoted through meetings and public venues, and also through the project web site including the Virtual Energy Efficiency School.

Topics like project identification schemes and methods; best project candidate selection criteria and filtration method; project development models and methods including technical analysis, cash flow and risk analysis, financial schemes and bankable proposals (business plans) were discussed and provided to interested parties through PowerPoint presentations, CD-ROMs, success stories brochures, other project materials and site visits.

In September 2003, a short movie about the large municipal street lighting project in Veliko Tarnovo was shot. This 30-minute film presents all stages of the project, starting from broken and damaged lighting fixtures and cable network, through the energy audit and

business plan development, bank approval for financing and finally, showed the 100 % illuminated streets of the former capital of Bulgaria. Interviews were taken from representatives of stakeholders – Mr. Edward LaFarge, USAID Sofia, Dr. Rumen Rashev, Mayor, Mr. Stoyan Milanov, Director of the UBB Branch, Mr. Dimtcho Linkov, Local Project Manager of Electrotek, and Mr. Todor Zelenkov, Director of HIT Ltd that implemented the project.

This movie was made available on CD-ROM and DVD in Bulgarian and English. Copies were delivered to USAID Mission in Sofia and USAID Headquarters, Bulgarian governmental authorities including the State Energy Efficiency Agency, a number of non-governmental organizations and companies working on energy efficiency projects and other interested individuals. Copies were distributed with no charge for recipients.

Another CD-ROM containing information about the first DCA guaranteed project was also made available for the public – the one for the Pirinsko Pivo Brewery, where detailed presentation of the energy conservation options applied was made. This media was also available in Bulgarian and English language versions.

The last success stories were prepared and added to the MEEP projects brochures set for distribution to energy efficiency project sponsor and developers, energy efficiency centers, financial institutions, other entities and the general public. These are also maintained in electronic versions downloadable at any time from the project website.

Task 8 Capacity building

Subtasks

- Introduction of project evaluation methodology to banks, including risk assessment and mitigation and requirements to bankable proposals for long-term project financing;
- Presentation to project sponsors of models and methods, which were successfully implemented for bankable project identification and development;
- Introduction of feasible approaches to financial deal structuring;
- Involvement of representatives of successful project sponsors in workshops and training courses for presentation of received project tangible results and benefits;
- Periodic update of the MEEP web site to include web-based distance learning materials;
- Continuation of very successful peer exchange programs to provide information dissemination regarding:
  - Available funding mechanisms and their requirements;
  - Structure and requirements for successful completion of the commercial project development cycle;
  - US private sector and municipal experience with funding energy efficiency projects;
  - Available development programs, descriptions of current and planned USA, ExIm Bank and World Bank-sponsored projects

Achieved Results

The capacity building campaign conducted by Electrotek experts featured two basic approaches: direct contact and using information technologies. More than 70 meetings and on-site visits were organized to make the hands-on experience of potential project sponsors, developers and bank officers possible and enable direct know-how transfer as discussions proved mostly useful to clarify at once all issues of concern. The other approach was the web-based learning course on energy efficiency project development, where a detailed methodology was uploaded that explicitly pictured the whole process and project approval criteria of the bank.

Over 50 meetings with UBB officers in local branches and all 7 regions of UBB were organized. During these meetings Electrotek supported the feasible project identification and business plan review process through on-the-job training. All UBB branches were trained to perform due diligence of energy efficiency projects including the analysis of project related risks.

Other banks including FIB were also contacted and the bank specific information was provided on energy efficiency project assessment and feasibility.

For this reporting period, Electrotek's engineers and financial analysts met with more than 50 project sponsors and developers to present principal approaches and specifics of the feasible project identification, engineering design of energy efficiency and renewable energy projects including wind, hydropower and biomass. Meetings were organized in the MEEP office in Sofia and directly at project sponsor or developer's location.

The Electrotek team performed training courses through workshops in cooperation with partner organizations: ESD Bulgaria and ESD UK- 2 Workshops for Local Sustainable Energy Planning and Municipal Energy Efficiency Project Development in June and November 2003. Over 55 municipal representatives participated in each workshop. Another workshop on financing of municipal energy efficiency projects, organized jointly with Energy and Ecology in December 2003 also contributed to know-how transfer and capacity building in the energy efficiency project development.

Electrotek experts were invited as guest speakers on events of the First Bulgarian Biomass Association in June and September 2003, where successful MEEP experience with a focus on renewable energy projects was presented to the audience.

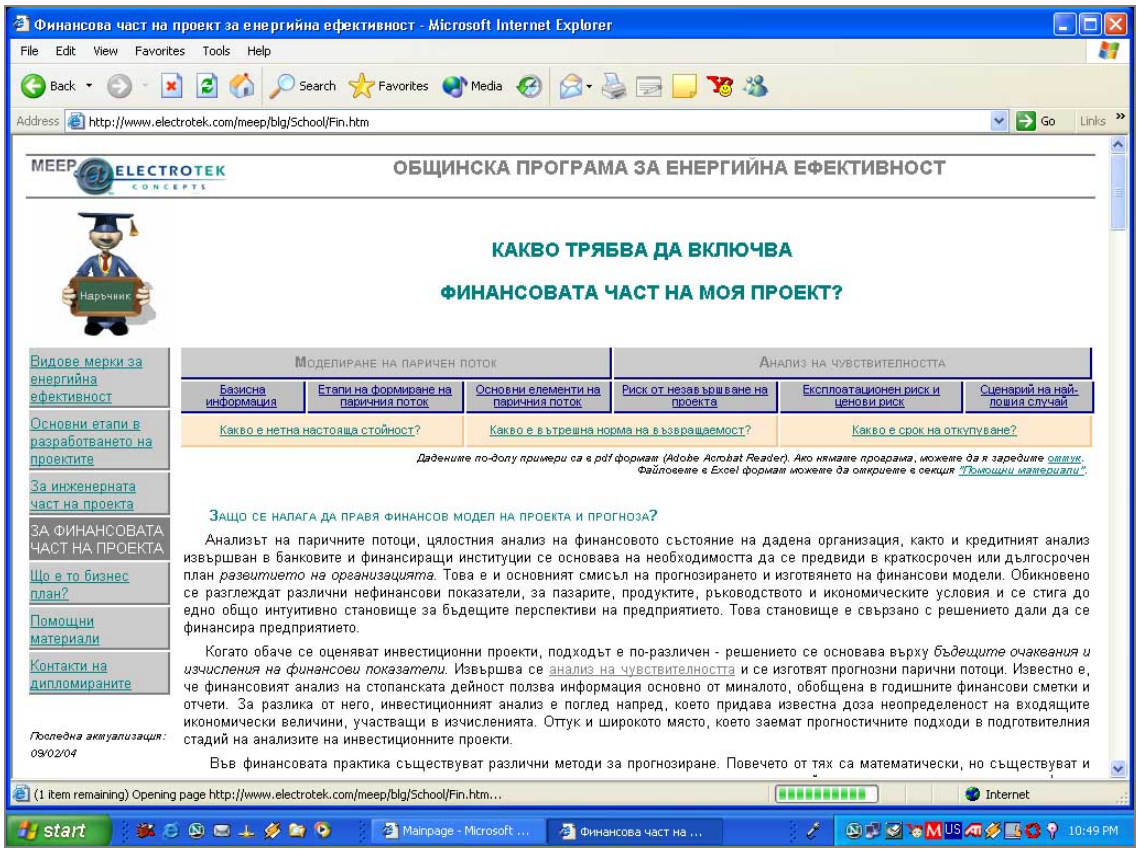
UBB officers responsible for MEEP also took part and gave presentations in most of these events to present the banking approach to the energy efficiency project financing and requirements to bankable proposals.

In June 2003 Electrotek launched the Virtual Energy Efficiency School web page within MEEP web site. This web page was specifically oriented to teach how to develop energy efficiency projects, illuminating issues like not only program mechanism in identification, feasibility and selection of projects, but also the engineering and financial models and risk assessment.

The page was split into several sections, starting from general information and basic engineering techniques for project development like detailed initial questionnaires for each type of energy efficiency projects already developed by Electrotek experts – including both municipal and industrial projects – street lighting, heating system retrofit and gasification, solid waste transportation, etc. Further construction of database files and technical model development for energy conservation

options was thoroughly explained and supported with examples from Electrotek's methodology files. The same pattern was applied for the financial section – including financial modeling of projects, sensitivity analysis and risk assessment. A special section about financial terms most often used by banks was also available. All materials were downloadable and easy to use by even non-experienced individuals. The language used was popular and without more than needed specific terminology.

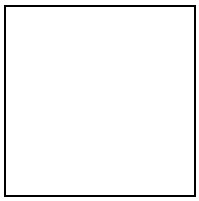
This web-based tool got the appreciation of the State Energy Efficiency Agency and the Ministry of Energy and Energy Resources some months after the upload as one of a kind in the country and highly useful with the explicit information and know-how provided there.



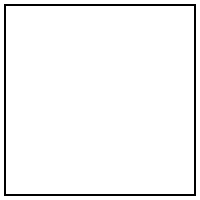
The Virtual School of Energy Efficiency web page had the following structure:

- Chapter 1. Typical energy conservation options in industries and municipalities.
- Chapter 2. Project development process – stages and major issues of concern.

- Chapter 3. The engineering part of a project: questionnaires and data base creation, formulation of desired energy conservation options and modeling, determining of most feasible energy efficiency measures.
- Chapter 4. The financial part of the project: general information about the financial analysis, cash flow modeling, sensitivity analysis and risk assessment, and explanation of an IRR, NPV, and payback period.
- Chapter 5. Business plan outline including resume, project sponsor, energy conservation options description, financial analysis, project benefits, licenses and permits.



- Chapter 6. Examples – basic downloadable files in MS Word and Excel formats used by Electrotek's team for the project development.
- Chapter 7. Address book of all successful MEEP/DCA project sponsors for further reference.



Task 10 Developed exit strategy to transfer the technical skills and methodologies to the financial institutions, the municipal and private sector sponsors and developer in order to insure sustainability for energy efficiency projects

Achieved Results

The draft exit strategy was submitted to USAID in in July 2003.

The exit strategy focused on the following key components:

- Capacity Building and
- Knowledge Transfer Using Information Technologies.

Capacity building for project sponsors, project developers and banks included a number of workshops and round tables for the presentation of feasible project development and due diligence approaches and lessons learned. In addition it included direct involvement of all interested parties in the project identification and development, and financial deal structuring. The Electrotek approach and results of this activity were presented in Task 8 section.

Knowledge Transfer Using Information Technologies section addressed the use of project website for transferring specific know-how to the generally less experienced and to the more advanced project sponsors, developers and bankers. The First Virtual Energy Efficiency School was launched and hosted by Electrotek MEEP web site in September 2003 and provided useful methodology to interested parties. Materials were easy to download and safe, the lectures were kept simple and most explicit with limited to required terminology. More complicated models were also provided for those who are more advanced with the engineering design but lack financial knowledge. Thus the 3-year MEEP and DCA experience of Electrotek was shared to the smallest level of detail, providing first-hand information, with the broadest accessibility and at the least-cost possible.

APPENDIX
Publications

Article in Industrial products and applications published in May 2004

Проект за енергийна ефективност в Многопрофилната болница за активно лечение – Свищов

Построена през 1978 г. Многопрофилната болница за активно лечение – Свищов се явява единственото здравно заведение за оказване на специализирана медицинска помощ на населението от общините Свищов, Белене, Бяла и Левски, което определя изключително голямото и социално значение. Здравното заведение разполага с 209 легла, в 12 отделения и 297 души персонал.

От месец септември 2000 г. МБАЛ – Свищов е търговско дружество, регистрирано по Търговския закон със собственик Община Свищов.

На територията на болницата се намират: основна сградата, състояща се от 11-етажен корпус и ниска част, в която са разположени поликлиника, специализирани отделения, административен блок и функционални помещения.

Топлоснабдяването на болницата се извършва от собствена парокотелна централа, разположена на разстояние около 100 м от основния корпус. В котелното са инсталирани два котела ПКМ–4М и един котел ПКМ-2.5М, проектирани за изгаряне на течно гориво – мазут. Произведената наситена пара се подава към абонатната станция и към мазутоподгревателната станция. В абонатната станция са обособени три самостоятелни кръга (горен, долен и поликлиника) с по два топлообменника за всеки кръг и още три паро-водни бойлера. Загрятата в тях до 90^{O}C вода посредством помпи циркулира в съответните кръгове на отоплителната инсталация. Котлите са пуснати в експлоатация от 1983 до 1985 г., като са им правени текущи ремонти, но от 1999 г. са спрени от експлоатация до отстраняването на предписанията, дадени от РИТН – Велико Търново.

Отоплението на сградите в МБАЛ се извършва с гореща вода по вертикална двутръбна мрежа с долно разпределение, с чугунени отоплителни тела и допълнително с електрически нагревателни уреди. Така съществуващата система за отопление не осигурява изискваната нормативна температура на въздуха в болничните помещения.

През отоплителният сезон 2002-2003 г. за отопление на болницата са консумирани 310 тона мазут на стойност 210 000 лв.

Ръководството на МБАЛ усилено търси изход от създалата се ситуация. В резултат на проведен енергиен одит на болницата и разработен инвестиционен проект се предлага реконструкция на котелната централа с цел подмяна на горивната база, изразяваща се в инсталиране на водогреен котелен агрегат за изгаряне на дървесни брикети произвеждани от действаща брикетираща инсталация в Свилоза АД.

В този брой на Индустриални Продукти и Приложения ще Ви запознаем с основните стъпки по реализацията на този енергиен проект.

В непосредствена близост до болницата се намира едно от най-големите български предприятия за производство на целулоза - Свилоза АД. От няколко години там се работи по проекти за оползотворяване на големите количества отпадна биомаса, разглеждана като екологичен риск. В предприятието има изградена действаща инсталация за производство на дървесни брикети с капацитет 3000 тон/год. В процес на изграждане са две други инсталации – още една за брикети (4000 тон/год) и друга – за производство на 12000 тон/год пелети от отпадъчна дървесна кора. Близостта на производителя, ниските транспортни разходи и голямото производство на брикети от Свилоза АД се отразява доста благоприятно на цената им, което напълно удовлетворява болницата.

Дървесните брикети и пелети представляват уплътнени сухи дървесни частици с влага 8-12%. Поради ниската влага калоричността им е 4,6 – 4,8 MWh/t, която превъзхожда тази на най-достъпните твърди горива в България. Имат ниско съдържание на пепел – от 1,5 до 5,0%. Дървесните брикети и пелети не съдържат свързващо вещество или други химически модификатори. При изгарянето на чиста дървесина се отделя въглероден двуокис в количество еквивалентно на това, което е погълнато от атмосферния въздух при растежа на дървото. Затова биомасата не променя CO_2-баланса на планетата и се счита за CO_2-неутрално гориво. Освен това дървесината е възобновяем и неизчерпаем енергиен източник. Използването й като гориво се счита за принос към устойчивото развитие. Екологичният аспект определено има и икономическо значение за настоящия проект, защото в България се очаква скоро да бъдат въведени еко-такси за изкопаемите горива, каквито вече са наложени в някои страни от Европейския съюз.

Липсата на котелен агрегат за изгаряне на биомаса българско производство и подходяща схема за финансиране са сред основните проблеми, които трябва да се решат.

За разрешаването им ръководството на болницата се обръща към Електротек Консептс – консултанти по Общинската програма за енергийна ефективност.
Финансирането на проекта се реализира по Общинската програма за енергийна ефективност на USAID – Американската агенция за международно развитие, която осигурява гаранция за кредита на общинската болница пред ОББ АД. Проектът и банковите документи са подготвени в един бизнес план от Електротек Консептс – изпълнител на ОПЕЕ и предадени в ОББ АД за получаване на кредит. Общата стойност на инвестицията възлезе на 312 х.лв., а искания кредит от банката е 90 х.лв. Останалите средства са вложени от самата болница с решение на общинския съвет на Община Свищов. Жизнеността на инвестицията се доказва от добрите финансови показатели, описани в бизнес плана. NPV на проекта е 296 316 лв., IRR – 33.73% , а срока на откупуване – 3.31 години. Затова и исканият кредит е за 37 месеца, с гратисен период от седем месеца. Икономиите от реализацията на проекта (т.е монтирането на новия котел) бяха оценени на приблизително 100 х.лв. средногодишно. Кредитът е одобрен от ОББ АД. Процесът от идентифицирането на проблема до финансирането, вкл. разработването, проектирането и подготовката на документите в банката отнема по-малко от 6 месеца.

Изграждане на котел за изгаряне на дървесни брикети

Новият водогреен котел за изгаряне на дървесни брикети е конструиран от фирма Промитемс Инженеринг - Георги Венев, а е изработен и монтиран в котелното на МБАЛ – Свищов от Промишлена енергетика АД – гр. Ямбол.

Котелът е с номинален товар 2 MW, 525 kg/h дървесни брикети, с коефициент на полезно действие около 80%. Компановката му е вертикална с долна цилиндрична газоплътна охлаждаема пещна камера и горен димогарен сноп. Доставените дървесни брикети се съхраняват в складово помещение, което е част от котелното, обособено като самостоятелен склад с преградна стена. От този склад горивото се подава в котела с транспортна лента. Първоначалното разпалване на котела се извършва с нафтова пилотна горелка. Основният и вторичният въздух за горене в котела се подават от два типа вентилатори: ВНСН–4 и ЕВВН–2.5. Изходящите от котела димни газове се отвеждат от котела през два циклона посредством димен вентилатор ВДГ-4. В циклоните димните газове се очистват около 85%, след което се изхвърлят през комин с височина 15 метра. При самото изгаряне на дървесна биомаса съществува риск от по-големи концентрации на прах в димните газове, както и концентрации на въглеродни и азотни окиси. Предварителният анализ на тези количества е показал, че при работа на котела с тази височина на комина, концентрациите на вредни емисии са доста под пределно допустимите стойности на емисиите прах, отделяни от малки горивни инсталации, които за нашата страна са 150 mg/Nm^3. В описаната конструкция могат да се изгарят директно дървесни отпадъци без сушене и брикетиране, което има и своите недостатъци, свързани най вече с влошаване на характеристиките на горивния процес и параметрите на котела. Избраната вертикална конструкция позволява да бъдат разработени и внедрени в експлоатация както серия водогрейни, така и серия парни котелни агрегати с мощност от 0.1 MW до 10 MW.

Реконструкция на парокотелната централа

Проведеният по Закона за Обществените поръчки търг за реконструкция на парокотелната централа на МБАЛ – Свищов е спечелен от Промишлена Енергетика Ямбол АД. Проектът включва подмяна на все още работещия котел ПКМ-4М и авариралия такъв с нов водогреен котел, със скарно горене на брикети от дървесни частици с калоричност над 4,000 kcal/kg. Като резервен котел остана този с по-ниска мощност – ПКМ 2.5, който подлежи на ремонт и ще покрива върховия товар при по-сурови зимни условия. Новият водогреен котел има топлинна мощност 2 MW и работи с по-ниско налягане - 0.5 MPa (1.3 MPa за предишните парни котли) и с по-ниска температура – топлоносителят се загрява до около 105^{O}C, вместо предишните 190^{O}C. Новите мрежови тръбопроводи към абонатната станция на болницата са изградени от предварително изолирани тръби. Проектът включва още и инсталиране на въздуховоди и газоходи, нафтопроводи към котела, дренажи и въздушници. Качеството на котловата вода се гарантира от монтираната нова омекотителна инсталация.

Постигнатите резултати надхвърлиха нашите очаквания

Д-р Валери Атанасов
Управител на МБАЛ Свищов ЕООД

Кои са причините, довели до необходимостта от реализация на проект за енергийна ефективност в МБАЛ Свищов ЕООД?

От месец септември 2000 г. болницата е регистрирана като търговско дружество, ръководи се от управител и се финансира от бюджета на Община Свищов и НЗОК. Основните проблеми през последните три години, с които се сблъскахме, бяха високите разходи за закупуване на течни горива за отопление и битово горещо водоснабдяване на болницата. Необходимостта от намаляване на тези преки разходи и решаване на екологичните проблеми, свързани с изгарянето на високосернисти горива, ни доведе до решението за реализация на проект за енергийна ефективност.

Какви конкретни стъпки предприехте за осъществяване на поставените цели?

Реализирането на нашите цели изискваше внимателно анализиране на моментното състояние на болницата и затова започнахме с извършването на подробен енергиен одит. Резултатите еднозначно показваха необходимостта от реконструкция на парокотелната инсталация, с цел намаляване на енергийните разходи и повишаване на топлинния комфорт в болничните помещения. При разглеждане на анализираните данни бе установено, че разходите за течни горива за изгаряне в парова централа през отоплителния сезон 2002-2003 г. надхвърлят 210 000 лв. В същото време отоплението на сградите е крайно неефективно, липсата на средства и незадоволителното техническо състояние на парните котли позволяваха експлоатация на инсталираните мощности не повече от 6 часа в денонощието. В отопляемите помещения не се достигаше необходимата комфортна температура за извършване на основните дейности и се получаваха големи температурни разлики в денонощието. За да се създадат нормални условия, логично за доотопляване на помещенията се използваше допълнително електрическа енергия, разходите за която за горепосочения период надхвърлиха 78 000 лв. Очевидно беше, че лечебното заведение формира огромни разходи за отопление и битово горещо водоснабдяване, които се оказват непосилни с оглед ограничения бюджет. В качеството си на управител на МБАЛ изготвих техническо задание за изготвяне на инвестиционен проект за реконструкция на парокотелната централа. Въз основа на разработен инвестиционен проект от инж. Румен Витков от Свилоза АД и внесено от мен предложение в Община Свищов, на свое заседание Общинският съвет взе решение да започне реконструкцията на парокотелната инсталация в болницата.

Проектът се състоеше в реконструкция на котелната централа с изграждане на нов водогреен котел за изгаряне на екологични дървесни брикети.

За финансиране на проекта се обърнахме към фирма Електротек Консептс. Те ни помогнаха да структурираме проекта за търговско финансиране от ОББ АД в рамките на Общинска Програма за Енергийна ефективност, финансирана от Мисията на Американската Агенция за Международно развитие.

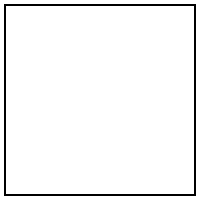
След одобряване на проекта и получаване на средствата по кредитна линия, започна същинската работа. За относително кратък период от време от м. септември до средата на м. декември бе извършен демонтаж на старите парни котли, инсталиране на нов водогреен котел за изгаряне на биомаса и

спомагателните му съоръжения, полагане на нова топлопреносна тръбна мрежа от котелното до абонатна станция, изграждане на складово стопанство за дървесни брикети.

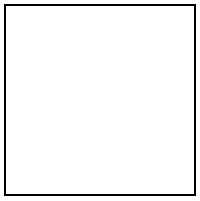
Как бихте оценили проекта?

Със задоволство мога да твърдя, че проектът е успешен и сме доволни от постигнатите резултати до момента. В резултат на извършената реконструкция на котелната централа се достигна постоянна температура на въздуха в отопляемите болнични помещения през цялото денонощие, която не падаше под 21оС. Разходите за електроенергия намаляха 2.5 пъти през настоящия отоплителен сезон в сравнение със сезона 2002-2003 г. Отчитаме близо 4 пъти намаляване разходите за закупуване на гориво през настоящия отоплителен сезон в сравнение с миналогодишния. Осигурява се непрекъснато топла вода за битови нужди, което в миналия отоплителен сезон беше почти невъзможно. Реализираният проект определено има голям екологичен ефект, свързан с намаление на емисиите от парникови газове в атмосферата в сравнение с изгарянето на високо сернисти течни горива.

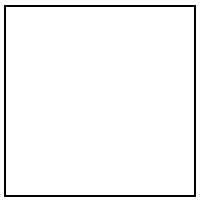
Article in Utilities magazine (Capital weekly edition), April 2004



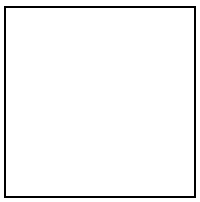
Publication in Capital Application for SME funding, April 2004



Article in 'Pari' daily about the Zaharni Zavodi investment in the plant, part of which was the energy efficiency MEEP project: issue 17 July 2003



Article in 'Pari' daily about the Agropolichim energy efficiency project – issue on 15 April 2003



Presentation of MEEP projects on the web page of the Czech Cultural Center in Bulgaria for investment needs -

www.czechcentres.cz/sofia

До началото на месец Март 2004 г. са извършени одити на над 127 предприятия от различни отрасли на икономиката. Благодарение на усилията на екипът от консултанти на Електротек Консептс, успешно са финансирани и внедрени 30 проекта на обща стойнойст $13.8 млн. В резултат на успешното финансиране и изпълнение на проекти за енергийна ефективност и ВЕИ общата инсталирана мощност за всичките 30 проекта е редуцирана с 10.8 MW, избегнатите емисии от CO_2 вследствие на това са над 46 хил. тона годишно в периода 2003 – 2010 г., спестени са над 33 хил. MW електрическа енергия и над 230 хил. GJ топлинна енергия. Ново и ефективно улично осветление е изпълнено в 160 български градове и села, газифицирани са 65 общински сгради в различни региони на страната. Инсталирана е една слънчева инсталация в дом за стари хора. Реализиран е проект за използване на биомаса за отопление в общинска болница. Извозването на твърди битови отпадъци в три града и 28 села се извършва с нови автомобили. 9 средни и големи български предприятия прилагат енергийно ефективни технологии и управление на енергията.